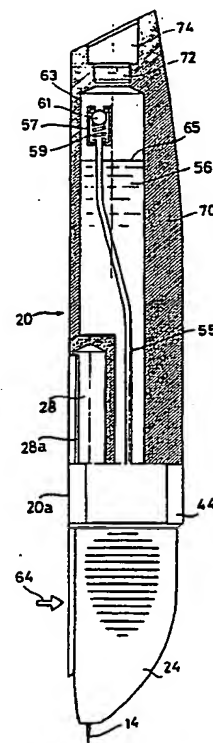




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: DEVICE FOR ATOMIZING A LIQUID-CONTAINING PRODUCT BY MEANS OF A PROPELLANT GAS, PARTICULARLY A PRODUCT SUITABLE FOR LOCAL TREATMENT OF PARTS OF THE BODY (57) Abstract Device for atomizing a liquid-containing product by means of a propellant gas, comprising a nozzle (24, 82) with an inner duct (4, 94) is connected to a product container (28, 92) and a surrounding, outer duct (8) is connected to a propellant gas container (56, 88), the outer wall of the outer duct (8) having a cylindrical configuration coaxial with the inner duct (4, 94) while the end wall part (24a) of the nozzle (24) defines the most forward part of the nozzle (24).		



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Device for atomizing a liquid-containing product by means of a propellant gas, particularly a product suitable for local treatment of parts of the body.

The invention relates to a device of the type as described in the preamble of Claim 1.

A device as described above is known from FR-A-1.483.066. In this known device the cross-section of the outer duct which is connected to the propellant container increases in the direction of the nozzle, while the nozzle opening itself is surrounded by a part of the nozzle with a cup-shaped inner wall-configuration which also is part of the operating grip; said grip is connected, by means of the product supply tube, to the valve, which controls the supply of the propellant gas. By means of this configuration is obtained that in the area which surrounds the nozzle opening, in which an over-pressure occurs, strong vortexes are generated so that - as is also the aim of this specific configuration - the liquid which is drawn out of the product duct is atomized finely and is distributed in a broad jet, so that the product will be distributed undirected over a relatively great surface. Furthermore practice has shown that the atomizing is accompanied by the formation of small droplets at the end-edge of the cup-shaped nozzle part so that the product also falls on places which are not to be covered.

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The invention aims to provide a device of the above-mentioned kind which is very suitable to apply very locally a liquid to be atomized, and particularly a liquid which is suitable for local treatment of parts of the body. This cannot be achieved with the known device, not only as a result of the effects as described above, but also as a result of the fact that operating the valve assembly is only possible by moving the grip with the nozzle so that it is not possible to direct the ejected jet accurately at a certain position.

According to the invention the device is characterized by the measures as described in the characterizing clause of the main claim.

When in the device according to the invention the rapid stream of propellant gas leaves the annular propellant gas duct zones with turbulent flow occur on either side of said annular duct, a first zone with diverging boundary line based on the outside edge of the annular duct, and a second zone with turbulent flow and converging boundary line in which a vacuum prevails and based on the inside edge of the duct; the two zones are separated by a zone in which a higher pressure prevails. The result is that the product to be atomized is drawn out of the central, inner duct, is very well atomized by the prevailing turbulent flow, and can be applied very well-directed to a particular surface.

The device according to the invention is therefore extremely suitable for the very local application of an atomized liquid, and as such is extremely suitable for local application to the skin of a product suitable for local skin treatment.

Advantageous further embodiments of this device according to the invention are described in the sub-claims.

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The invention is explained with reference to the drawing.

In it:

Fig. 1 is a schematic cross-section through an atomizing nozzle according to the invention, with reference to which the operating principle is explained;

Fig. 2 is a longitudinal section through the front part of a pen-shaped holder intended for holding and atomizing a product suitable for skin treatment;

Fig. 3 is a longitudinal section through a complete holder in the practically vertical position for use, the front part, shown in detail and in cross-section in Fig. 3, being shown in elevation;

Fig. 4 is a perspective drawing of this holder with closure cap;

Fig. 5a is a top-view of a second embodiment according to the invention;

Fig. 5b is a part view, part cross-section of this embodiment;

Fig. 5c is a perspective view of the product container used in these embodiments;

Fig. 6 is a perspective drawing of a package provided with three such holders.

Fig. 1 shows the front end of a nozzle 2 containing a central tube 4 whose bore 6 has a diameter D_1 , while the external diameter is indicated by D_2 . The tube 4 is in the centre of an annular duct 8 with internal diameter D_3 . This duct 6 is the product feed duct, and the duct 8 is the propellant gas feed duct. The average diameter of the duct 8 is indicated by D_{gem} .

As the figures 1 and 2 show the, flat, end wall 24a defines the most forward part of the nozzle 2.

When no propellant gas is being supplied through the duct 8, the product in the bore 6 of the tube 4 will

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show a concave meniscus 10 due to the capillary action. When propellant gas is supplied, two zones with a turbulent propellant gas flow form, as shown in the figure: starting from the outside edge of the annular duct 8 a first, annular zone 12 with a diverging surface 12a as the boundary line at one side and at the other side a cylindrical surface 12b with a diameter which is approximately equal to twice the diameter D_{gem} , and a second zone 14 bounded by a conical surface 14a starting from the outside edge of the tube 4, and centred on the axis 16. The pressure distribution in these two zones is indicated by the symbols \oplus and \ominus .

The result is that in the zone 14 the product is drawn out of the bore 6 of the product feed tube 4 and is sprayed in a very well atomized manner. Due to the shape of the zone 14 and the specific configuration of the nozzle 2, the atomized product can be concentrated with very great accuracy on a particular place. It is found that droplet formation on the nozzle does not occur.

Due to these properties, the nozzle described is extremely suitable for use in an appliance for local administration of substances for skin treatment, not only by medically trained people, but also by laymen and children, and no contact is needed between the part of the skin to be treated and the atomization device, which is, of course, very important from the point of view of hygiene. Such an appliance will be described with reference to Figs. 2 to 5.

In Figs. 2 to 4, reference number 20 indicates a pen-shaped holder, which is closed with a closure cap 22 and provided with an atomizer nozzle 24. Details thereof and of the propellant gas valve assembly disposed therein emerge in particular from Fig. 2. This figure shows the product supply tube 4 which is fixed in the nozzle part 24 and is surrounded by the annular duct 8 into which the downward sloping propellant gas duct 26 opens. The tube 4 extends

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backwards and opens into a product chamber 28, while the duct 26 passes into a duct part 30 running parallel to the tube 4 and containing a plug 32 which slides therein in the lengthwise direction, is under the action of the spring 34 and is sealed relative to the nozzle part 24 by the O-ring 36. A tube 38 is fixed by one end in the plug, and the other end is fixed in a second plug 40 which is slidably guided in a bore formed in an insert 42 fixed to the centre part 44 of the container which connects to the nozzle part 24. At the righthand end the plug 40 is shut off with the shutoff stop 46, and in the centre the plug has a transverse duct 48 opening into the annular space 50 between the plug and a second insert 52 which is accommodated in sealing fashion between the first insert 4 and the shoulder 53, and whose duct 54 is connected to the propellant gas tank 56 via the tube 55 which ends in a valve chamber 57. As is known per se for other applications, this gas tank 56 contains a liquid which evaporates rapidly under atmospheric conditions and can thus produce a propellant gas. This liquid will be described below as "liquid propellant gas". The valve chamber 57 contains a (weak) spring 59 which acts on the shutoff ball 61 which works in concert with the sealing ring 63. This means that during use of the device, when the container 20 is in a more or less upright position, liquid propellant gas is prevented from penetrating into the valve mechanism, since the valve chamber 57 then lies above the liquid level indicated by 65. Of course, liquid propellant gas cannot penetrate into the valve mechanism during storage in a horizontal position either.

The valve mechanism is operated by the push-button 58 which is pivotally mounted in the nozzle part 24 at 60, and the operating arm 62 of which engages behind the plug 32. When the push-button is pressed in the direction of the

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5 arrow 64, the arm 62 moves to the left and during this movement takes the plug 32 with it; the second plug 40 is also moved to the left via the tube 38, so that its end stop 46 no longer shuts off the end of the duct 54, as a result of which a connection with the atmosphere is produced and such a great pressure difference occurs over the ball valve that the propellant gas will flow out of the propellant gas chamber 56, via the valve chamber 57, the tube 55, the duct 10 54, the annular chamber 50, the transverse bore 48 and and tube 38 into the duct 26, and thus into the annular chamber 8 around the end of the tube 4, and will thereby produce the desired effect at the mouth.

15 The push button 58 carries a cam 58a which ends above the opening 58b of an elongate chamber 58c, running in the longitudinal direction of the device and containing a ball 58d. Only in the operating position of the device, thus when the point of it is directed downwardly, the ball 58d is free of the opening 58d and can the assembly be operated.

20 Fig. 3 shows a longitudinal section through the complete holder with the nozzle 24, the central part 44, and the end part 70 which is shut off with the usual filling valve 72 and a closure cap 74. The product to be atomized is accommodated in an exchangeable chamber 28 which is, of course, not pressurized, in which may, if necessary, be 25 provided with a transparent edge part 28a which is visible through a slit 20a in the container 20, so that the level of the contents of the chamber is directly visible.

30 Fig. 5a shows schematically, in top view, and fig. 5D schematically in part sight view, part cross-section a second embodiment according to the invention in which a particular kind of separate product container is used which is supplied apart from the device and which, once being placed into the device, cannot be removed anymore. The valve mechanism and the nozzle configuration are not shown

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in these drawings as they are as described before.

The holder as shown in the Figures 5a and 5b, and indicated there with reference numeral 80, has the configuration as described above with the nozzle part 82, the middle part 84 and the end part 86. The middle part 84 has a cut-out part 85 above the propellant gas chamber which is indicated with reference 88, as said the valve assembly connected to the propellant chamber 88 is not shown.

The product container is, as said, a separate part, shown in perspective in Figure 5c, and indicated there with 90. This product container comprises a longitudinal parallele-pipedum-shaped chamber 92 with the product supply tube 94 and this chamber carries at the side opposite the tube 94 the strip 96 which is pivotally connected thereto and has at its end the transverse end part 98. This end part carries the hook 100 which fits in a corresponding cut-out in the holder part 94.

To put the product container 90 into place it is put into the cut-out 85 with the product supply tube 90 directed to the nozzle 82; thereafter the product container 90 is pushed forwardly until the front end 92a of the chamber 92 abuts against the end edge 94a of the nozzle, which is the position as shown in Figure 5b. Thereafter the strip 96 is pushed downwardly so that the hook 98 fits into the cut-out 100. The product container is now closely connected to the holder.

Products which can be atomized could be iodine, chlorhexidine and various cosmetic products. Three holders, each filled with one of these products which are pre-eminently suitable for treating damaged parts of the skin, can be placed in a common package, as shown in Fig. 6. The package, indicated in its entirety by reference number 110, comprises the base 112 with suitable slots for the nozzles of the three holders 114, 116 and 118, and closed with the

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closure cap 120. All this results in a product which looks attractive and is easy to store.

C L A I M S

1. Device for atomizing a liquid-containing product by means of a propellant gas, particularly a product suitable for local treatment of parts of the body, comprising a nozzle (24, 82) with two, mutually coaxial ducts of which the inner duct (4, 94) is connected to a product container (28, 92) and the surrounding, outer duct (8) is connected to a propellant gas container (56, 88), characterized in that the outer wall of the outer duct (8) has a cylindrical configuration coaxial with the inner duct (4, 94) and in that the end wall part (24a) of the nozzle (24) in which this duct (8) abuts defines the most forward part of the nozzle (24) in such a way that a narrow bounded, sharply conical narrowing product duct (40) is obtained.

2. Device according to claim 1, characterized in that the end wall part (24a) surrounding the mouth constitutes a flat surface.

3. Device according to claims 1-2, characterized in that the inner duct (94) is fixed to the product container (90) which constitutes a separate and exchangeable element.

4. Device according to claims 1-3, characterized by an elongated pen-shaped housing (20, 80) with at one end the nozzle (24, 82) and, following this, the product duct (4, 904) running in the longitudinal direction of the housing and opening into the liquid container (28, 902), which lies in the upper part of the housing, while a propellant gas duct (26) goes out of the angular duct and opens into an elongated valve assembly (32, 34, 36, 40, 42, 46, 50) running in the longitudinal axis of the housing and connected at the other end to an elongated propellant gas chamber (56).

5. Device according to claim 4, characterized in

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that a hand-operated control element (58) for the propellant valve assembly is disposed between the nozzle (24, 82) and the product chamber.

5 6. Device according to claim 5, characterized in
that the control element (58) is formed by a control button
slidingly or pivotally provided in the housing wall and
having a lever (62) which stands at right angles to the
longitudinal axis of the housing and co-operating with the
propellant gas valve assembly and which carries a locking
10 cam, lying transversely to the longitudinal housing axis of
which the free end lies above an opening (58b), provided in
the rear end of a chamber running in the longitudinal
direction of the housing and enclosing a freely movable
locking ball (58d).

15 7. Device according to claim 1-6, characterized
in that the housing (20, 80) is hexagonal in cross-section,
and comprises in the upper part a cut-out (85) for the
product container, (92) while the propellant gas chamber
(56, 88) lies partly below this product container and,
20 following this, takes up the entire inner space of the
housing.

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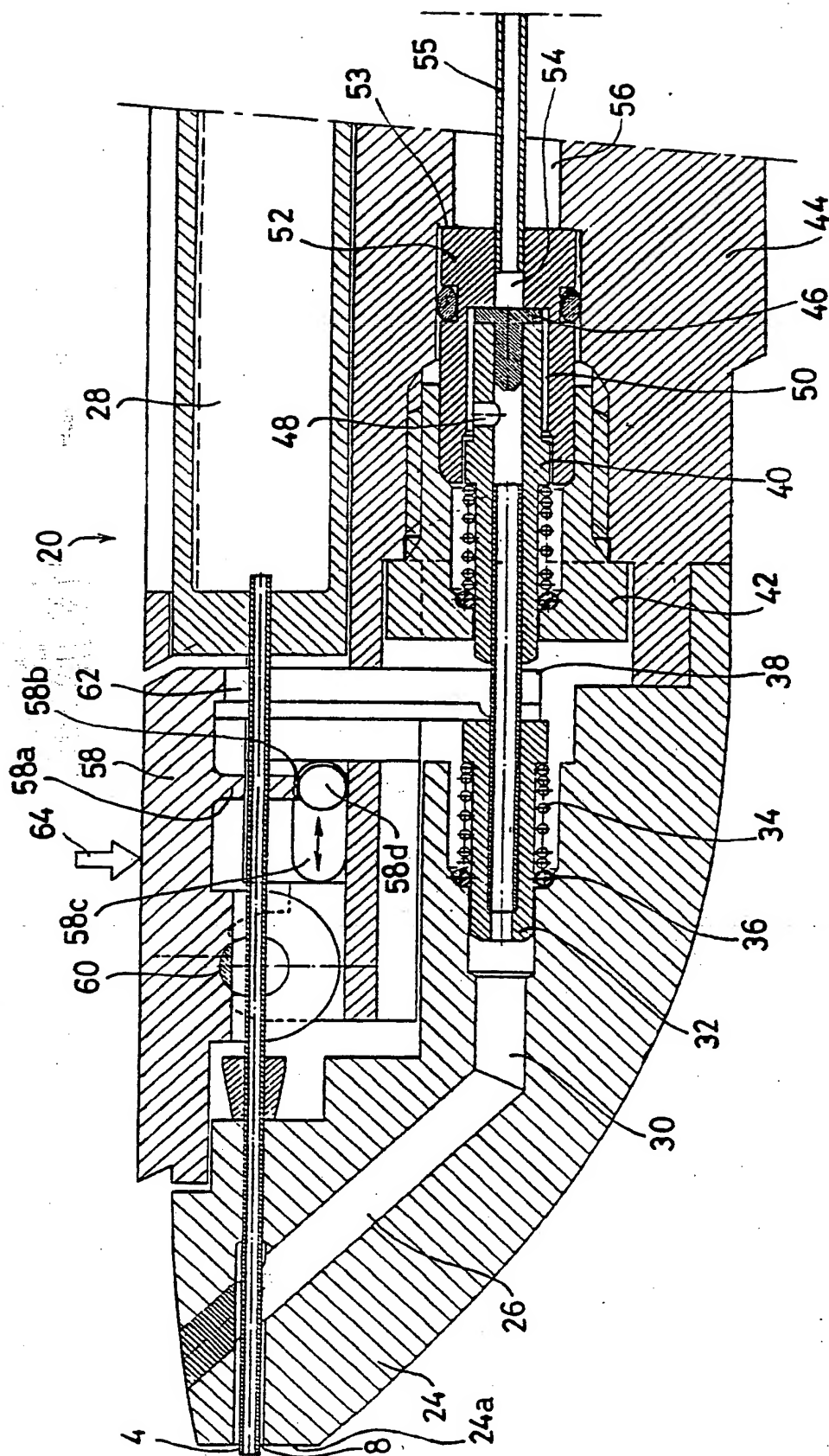
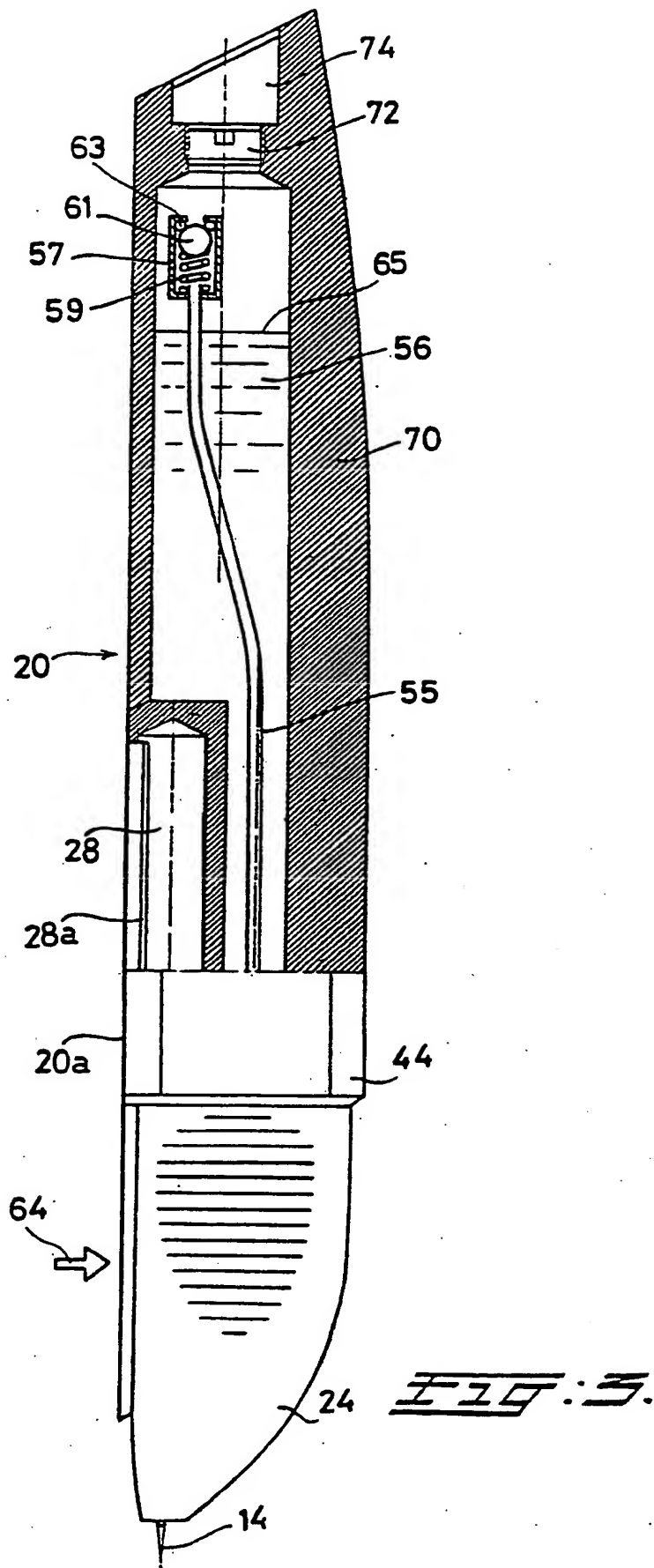


FIG. 2.



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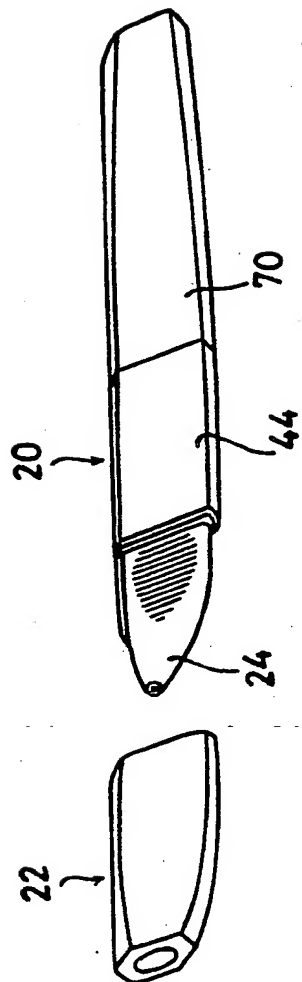


Fig. 4.

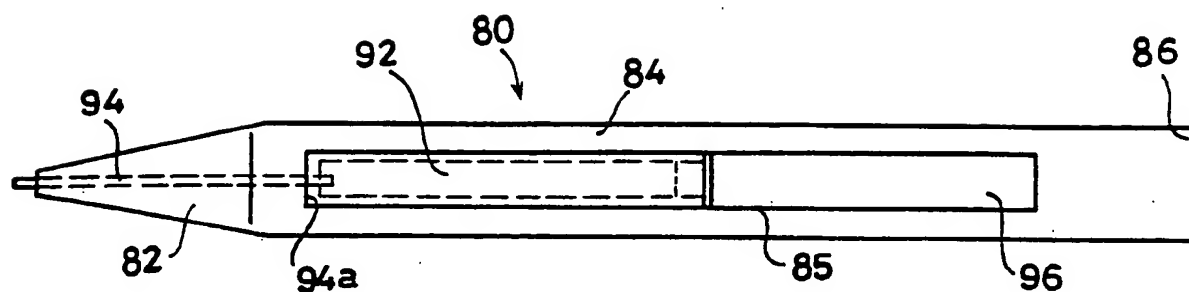


FIG. 5a.

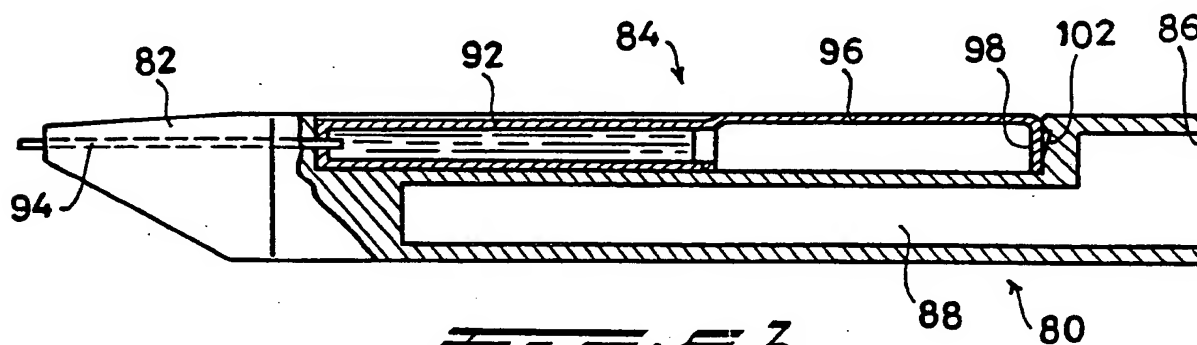


FIG. 5b.

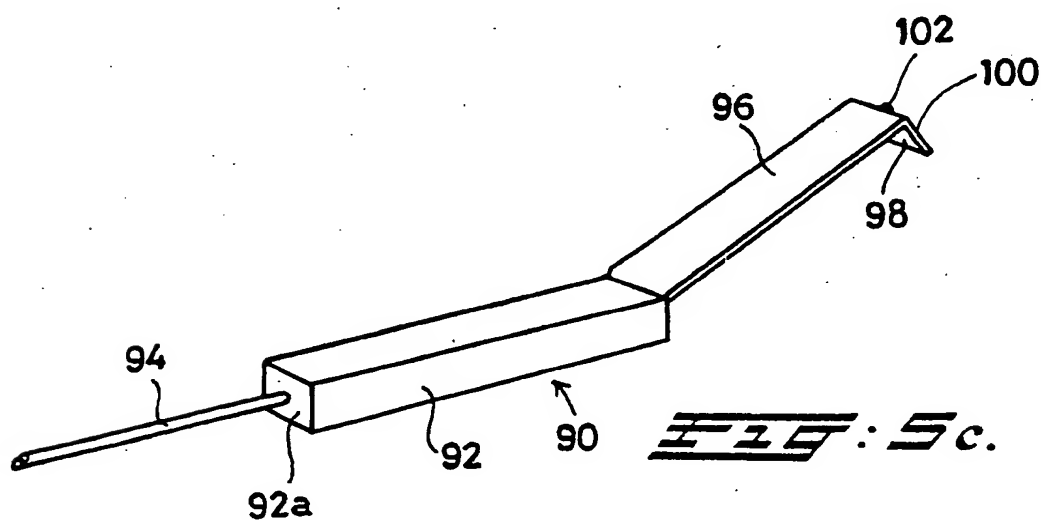
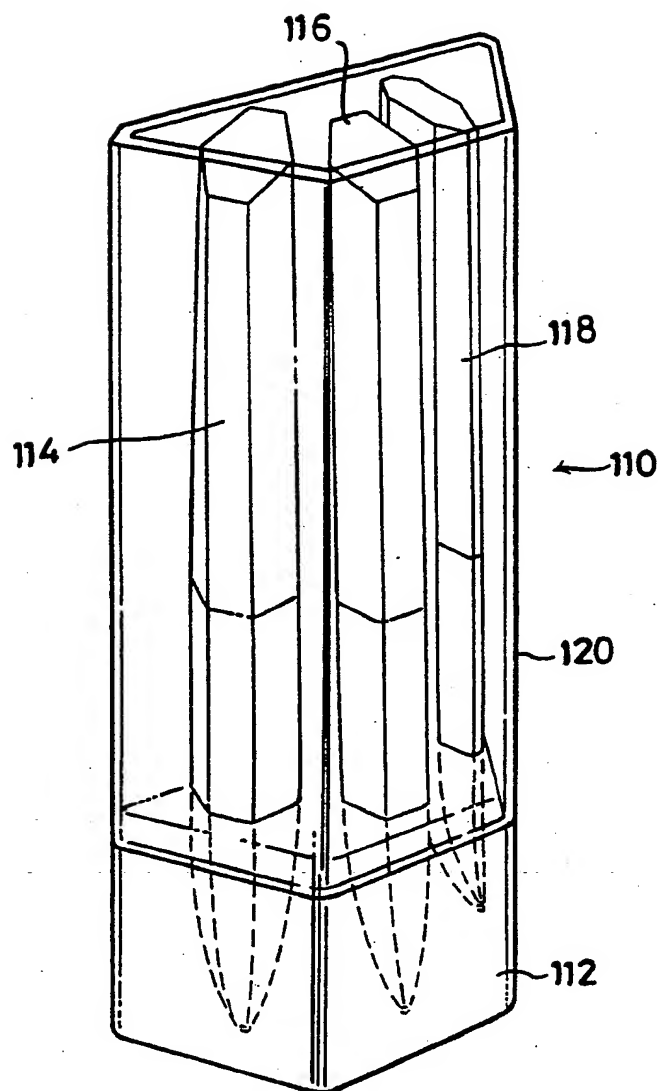


FIG. 5c.

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**FIG. 6.**

INTERNATIONAL SEARCH REPORT

International Application No PCT/NL 89/00011

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) *

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC⁴: B 65 D 83/14; B 05 B 7/24

II. FIELDS SEARCHED

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Classification System

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IPC⁴

B 65 D; B 05 B

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched *

III. DOCUMENTS CONSIDERED TO BE RELEVANT *

Category *	Citation of Document, ¹¹ with Indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
A	DE, U, 8705600 (ROTRING-WERKE RIEPE KG) 16 July 1987, see figures 1-4,6; page 8, line 4 - page 9, line 27; page 11, line 15 - page 13, line 7; page 1, lines 12-20 --	1-5
A	US, A, 2561570 (E.L. HADDEN) 24 July 1951, see figures 1,3,9,10; column 2, lines 14-28; column 4, lines 10-24 --	1
A	FR, A, 1437550 (SOCIETE SPRIDO-CELLA) 1966, see figures 3,4,6; page 2, left-hand column, line 40 - right-hand column, line 16 ----	1

* Special categories of cited documents: ¹⁰

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IV. CERTIFICATION

Date of the Actual Completion of the International Search

9th June 1989

Date of Mailing of this International Search Report

07. 07. 89

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer

P.C.G. VAN DER PUTTEN

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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

NL 8900011
SA 27546

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on 27/06/89
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-U- 8705600	04-06-87	None	
US-A- 2561570		None	
FR-A- 1437550		None	

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